Intubation

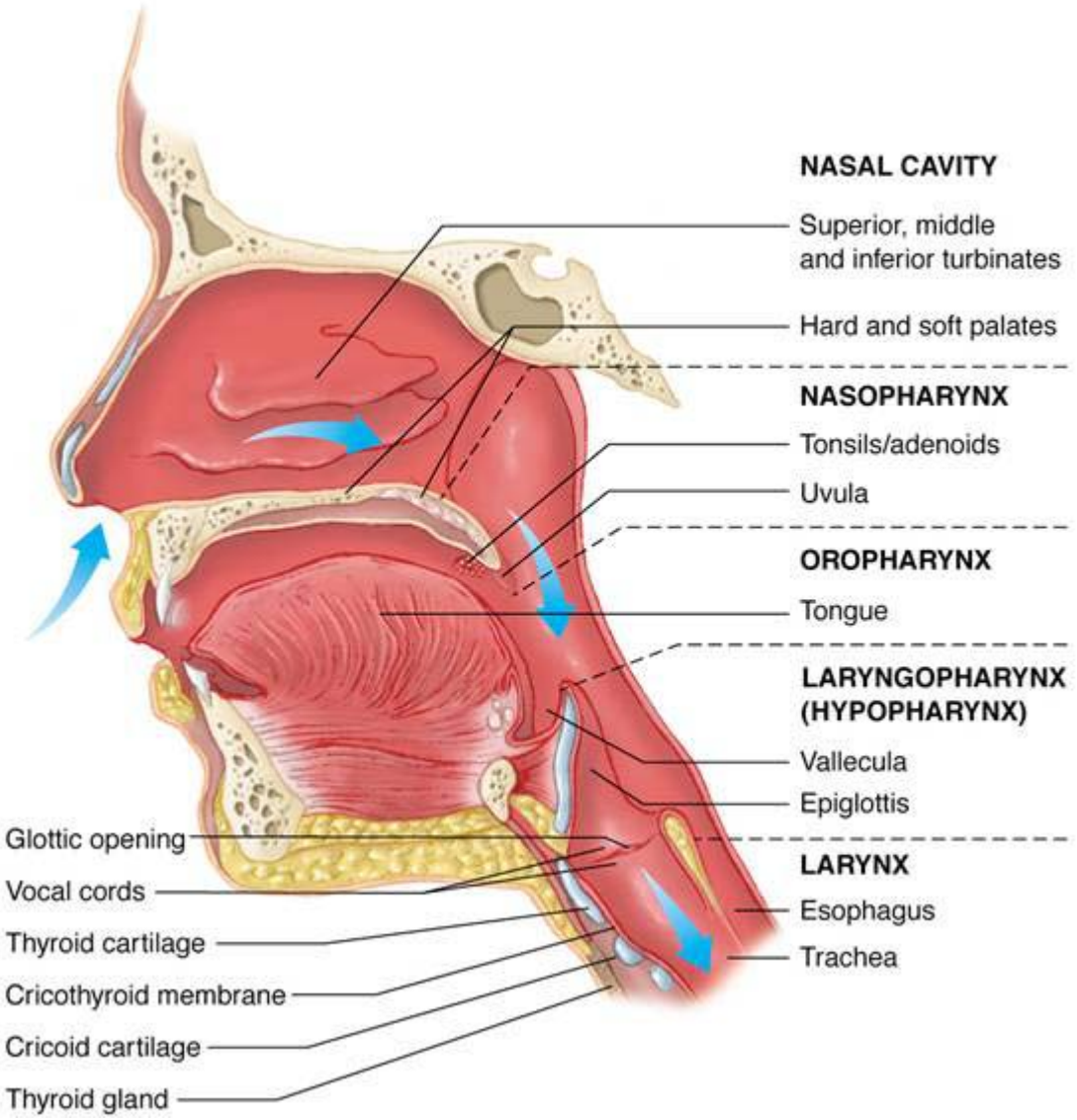
Airway management and ventilation are the first and most critical steps in the initial assessment of every patient you will encounter.

Topics

- Anatomy of the respiratory system
- Physiology of the respiratory system
- Respiratory problems
- Respiratory system assessment
- Airway management

Anatomy of the Respiratory System

Anatomy of the Upper Airway



Upper Airway

- Nasal cavity
- Oral cavity
- Pharynx

Pharynx

- Nasopharynx
- Oropharynx
- Laryngopharynx

Nasal Cavity

- Maxillary bone
- Frontal bone
- Nasal bone
- Ethmoid bone
- Sphenoid bone
- Septum

- **Sinuses**
- **Eustachian tubes**
- **Nasolacrimal ducts**
- **Nares**
- **Mucous membranes**

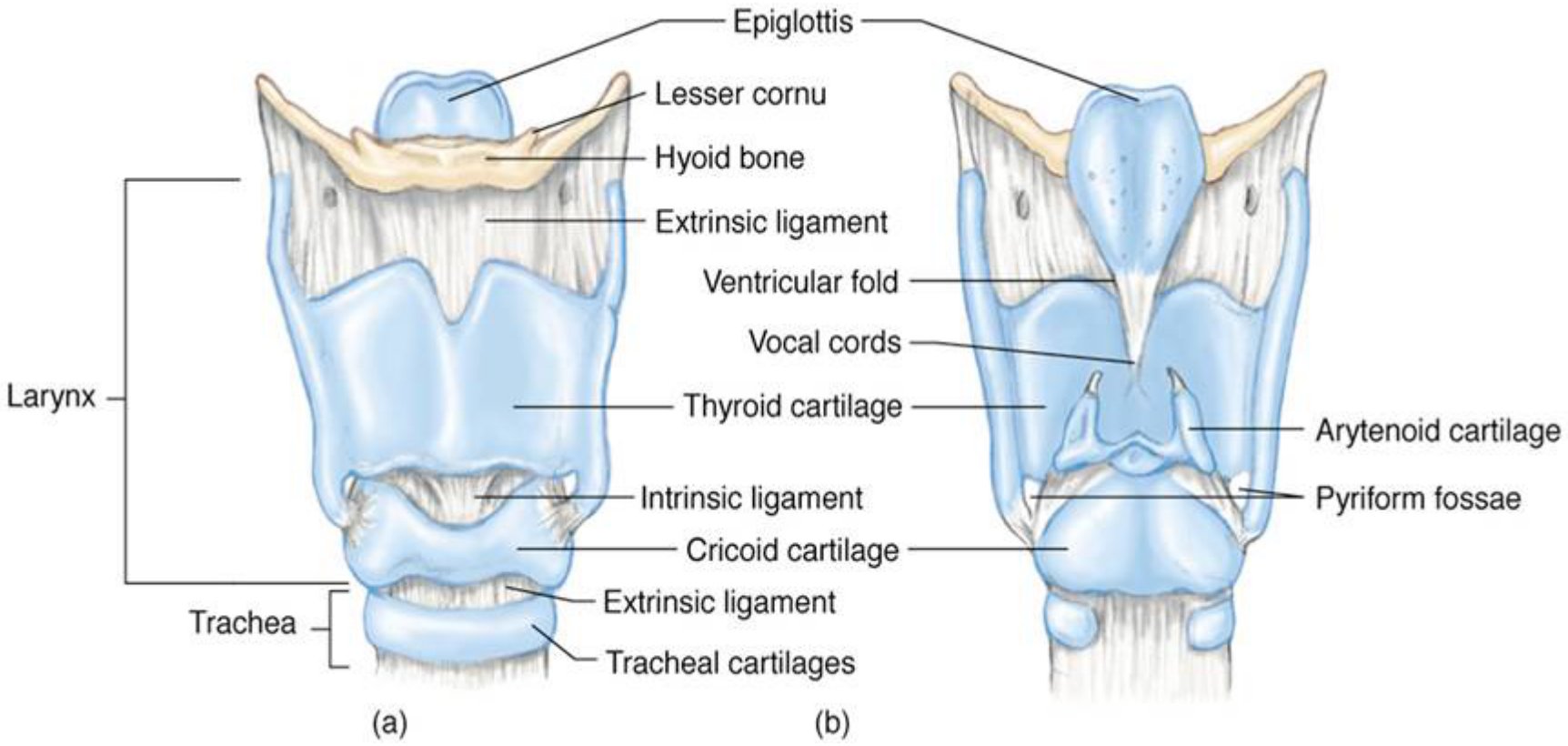
Larynx

- Thyroid cartilage
- Cricoid cartilage
- Glottic opening
- Vocal cords
- Arytenoid cartilage
- Pyriform fossae
- Cricothyroid cartilage

Oral Cavity

- Cheeks
- Hard palate
- Soft palate
- Tongue
- Gums
- Teeth

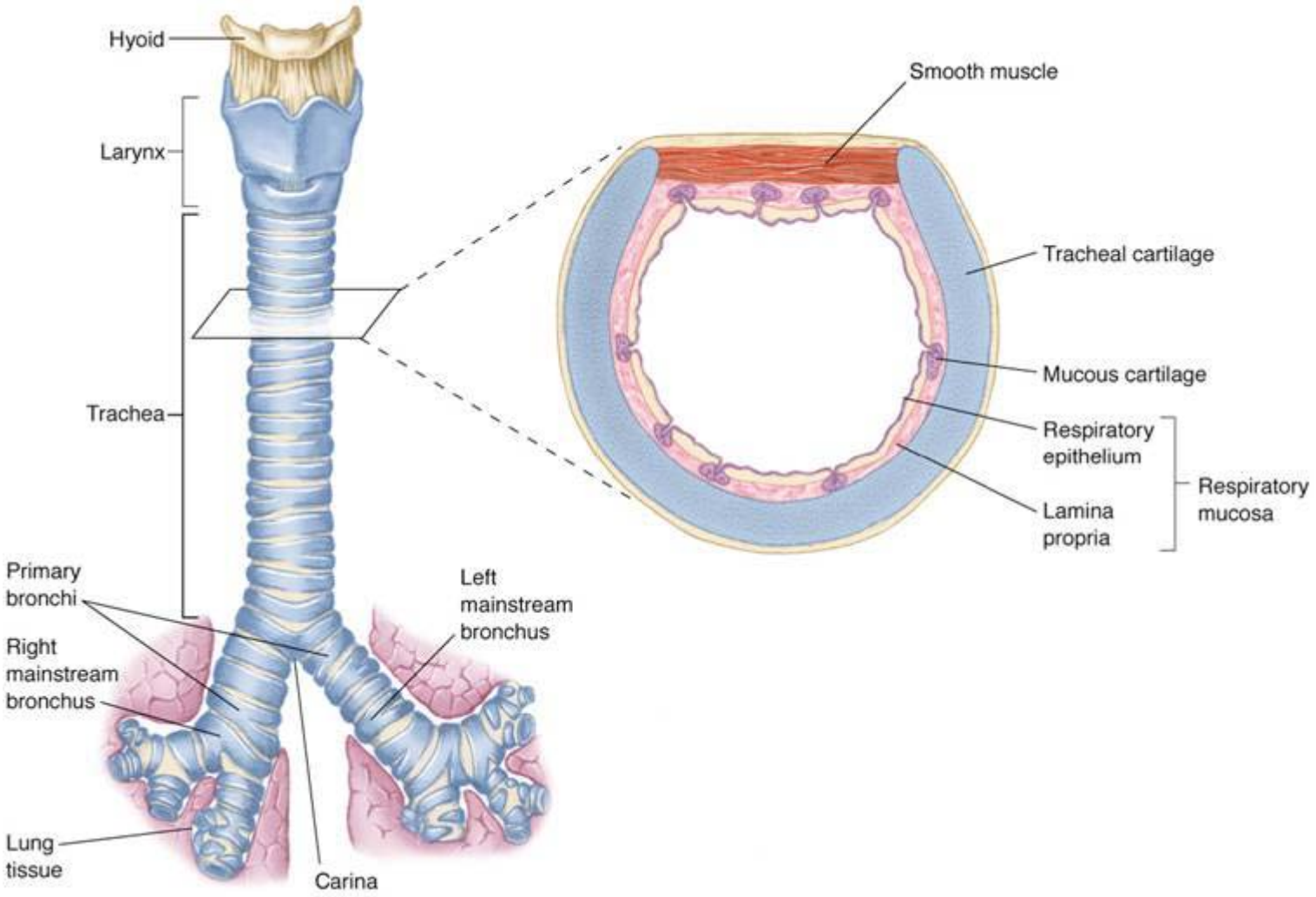
Internal Anatomy of the Upper Airway



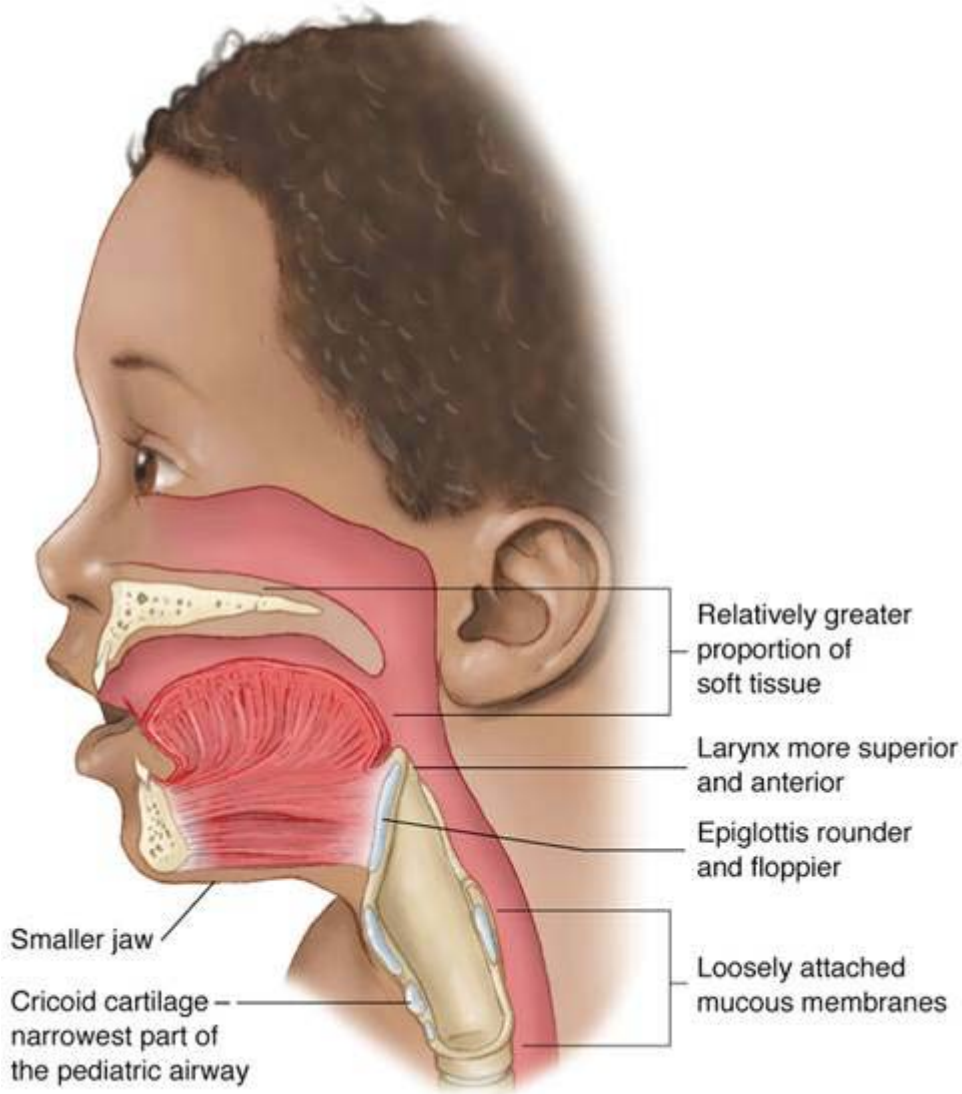
Lower Airway Anatomy

- Trachea
- Bronchi
- Alveoli
- Lung parenchyma
- Pleura

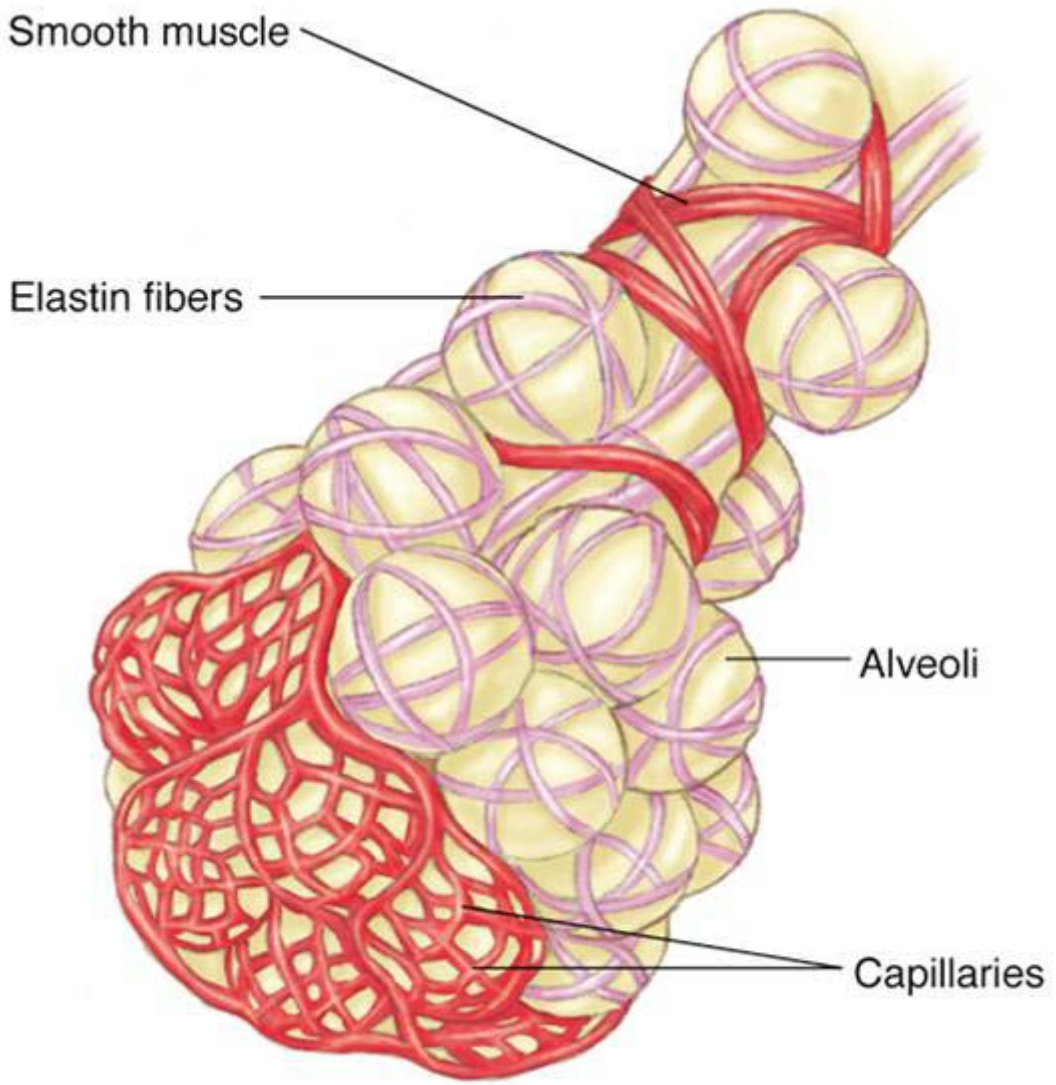
Anatomy of the Lower Airway



Anatomy of the Pediatric Airway



Anatomy of the Alveoli

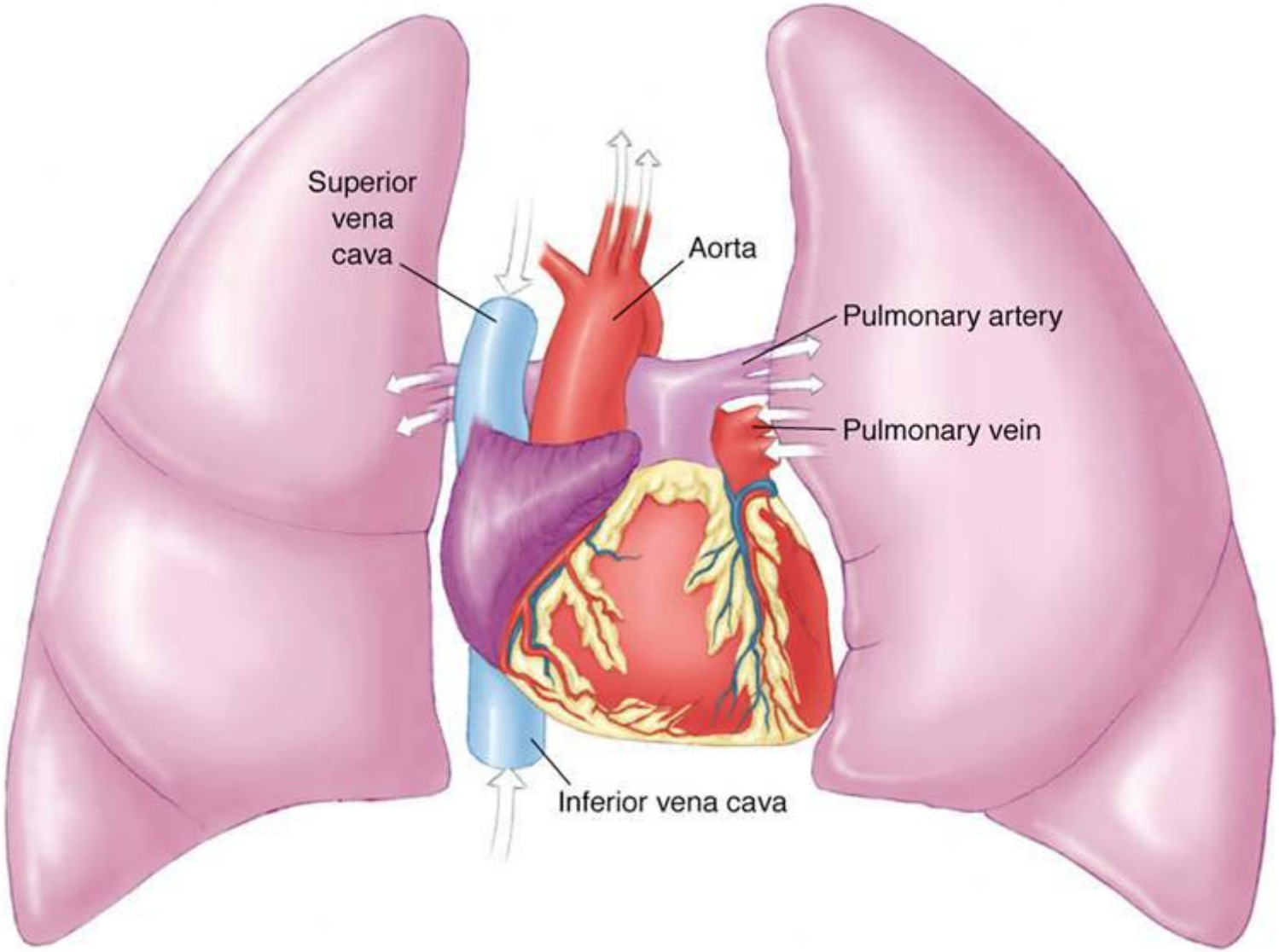


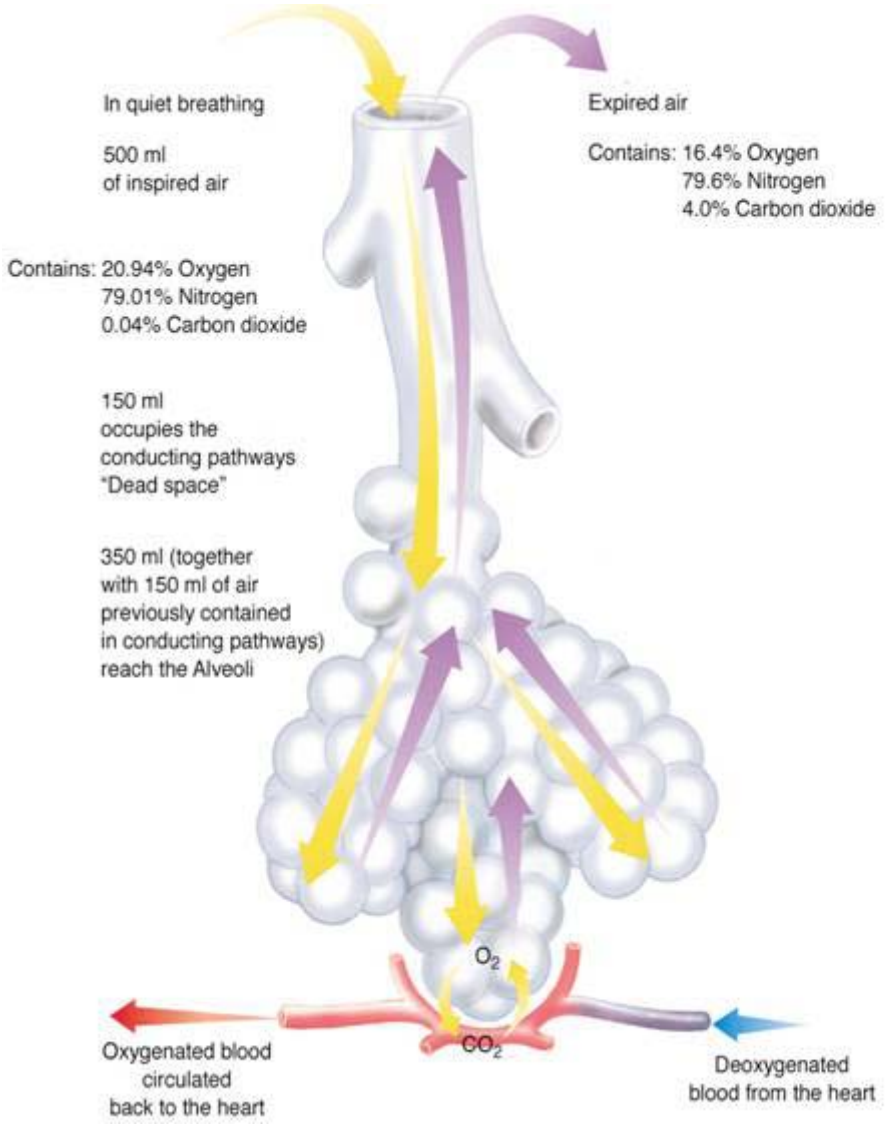
Physiology of the Respiratory System

Introduction

- Respiration is the exchange of gases between a living organism and its environment.
- Ventilation is the mechanical process that moves air into and out of the lungs.

Pulmonary Circulation





Diffusion of Gases Across an Alveolar Membrane

Normal Respiratory Rates

Age	Rate Per Minute
Adult	12-20
Children	18-24
Infants	40-60

Respiratory Factors

Factor	Effect
Fever	Increases
Emotion	Increases
Pain	Increases
Hypoxia	Increases
Acidosis	Increases
Stimulants	Increase
Depressants	Decrease
Sleep	Decreases

Dead Space Volume (VD)

- Amount of gases in tidal volume that remains in the airway.
- Approximately 150 ml in adult male.

Tidal Volume (VT)

- Average volume of gas inhaled or exhaled in one respiratory cycle.
- Average adult male

V_T = 500 ml (5-7 cc/kg)

Functional Residual Capacity (FRC)

The volume of gas that remains in the lungs at the end of normal expiration.

FRC = ERV + RV

Expiratory Reserve Volume (ERV)

The amount of air that can be maximally exhaled after a normal expiration.

Residual Volume (RV)

The amount of air remaining in the lungs at the end of maximal expiration.

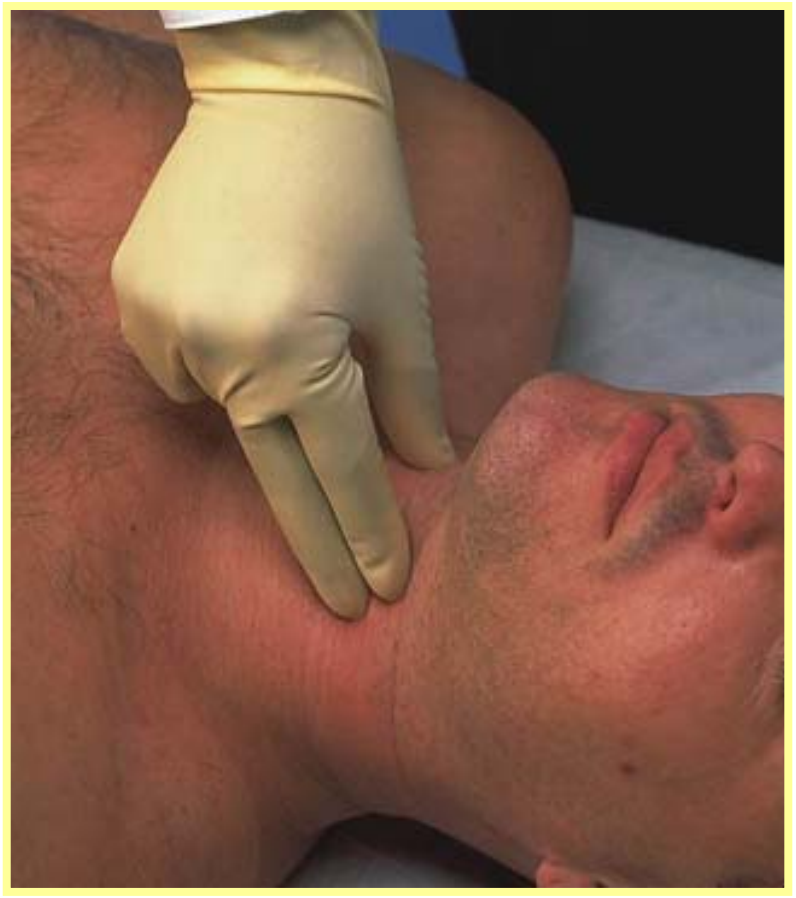
Airway Obstruction

The tongue is the most common cause of airway obstruction.

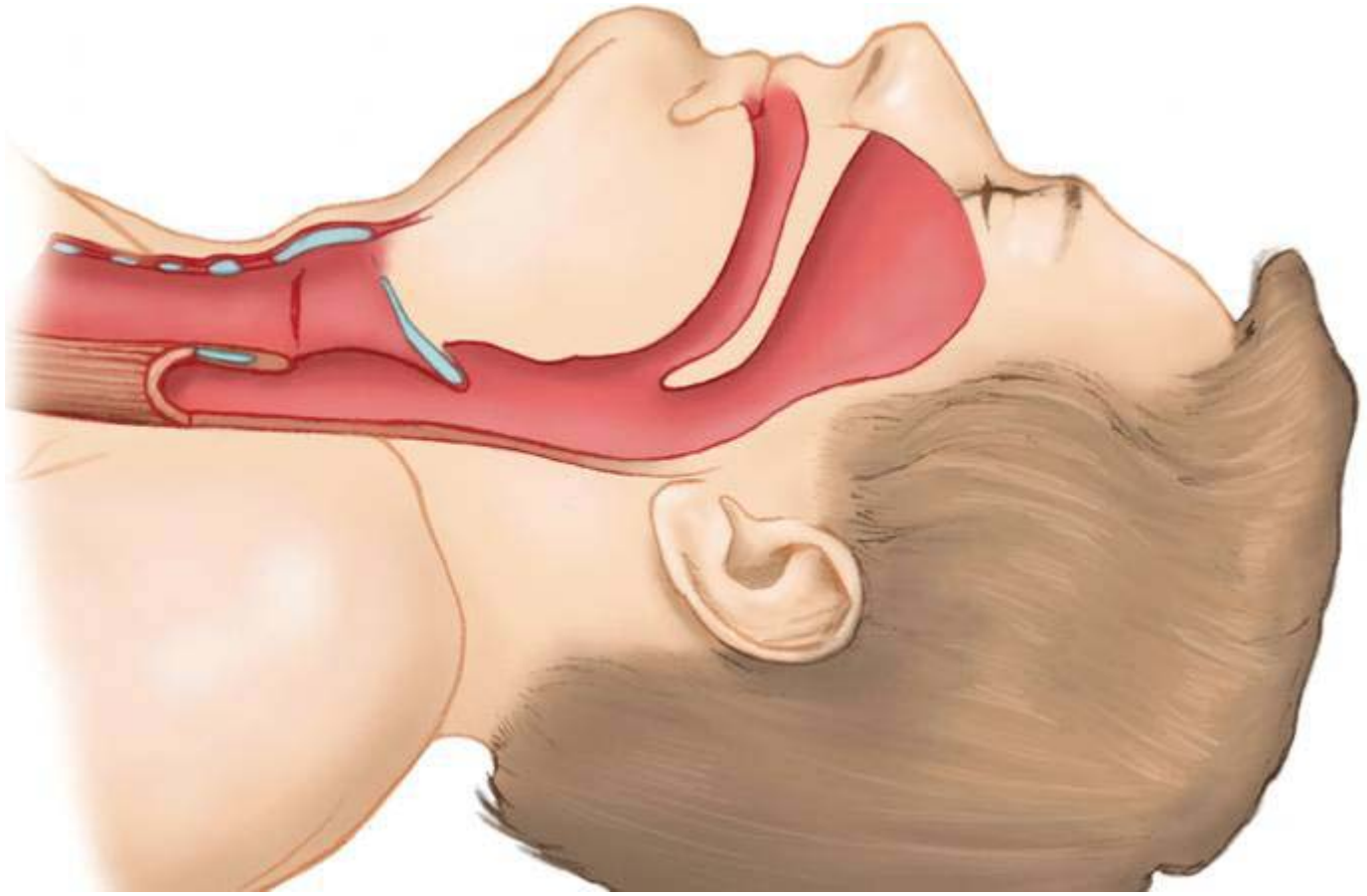
Other Causes of Airway Obstruction

- Foreign bodies
- Trauma
- Laryngeal spasm and edema
- Aspiration

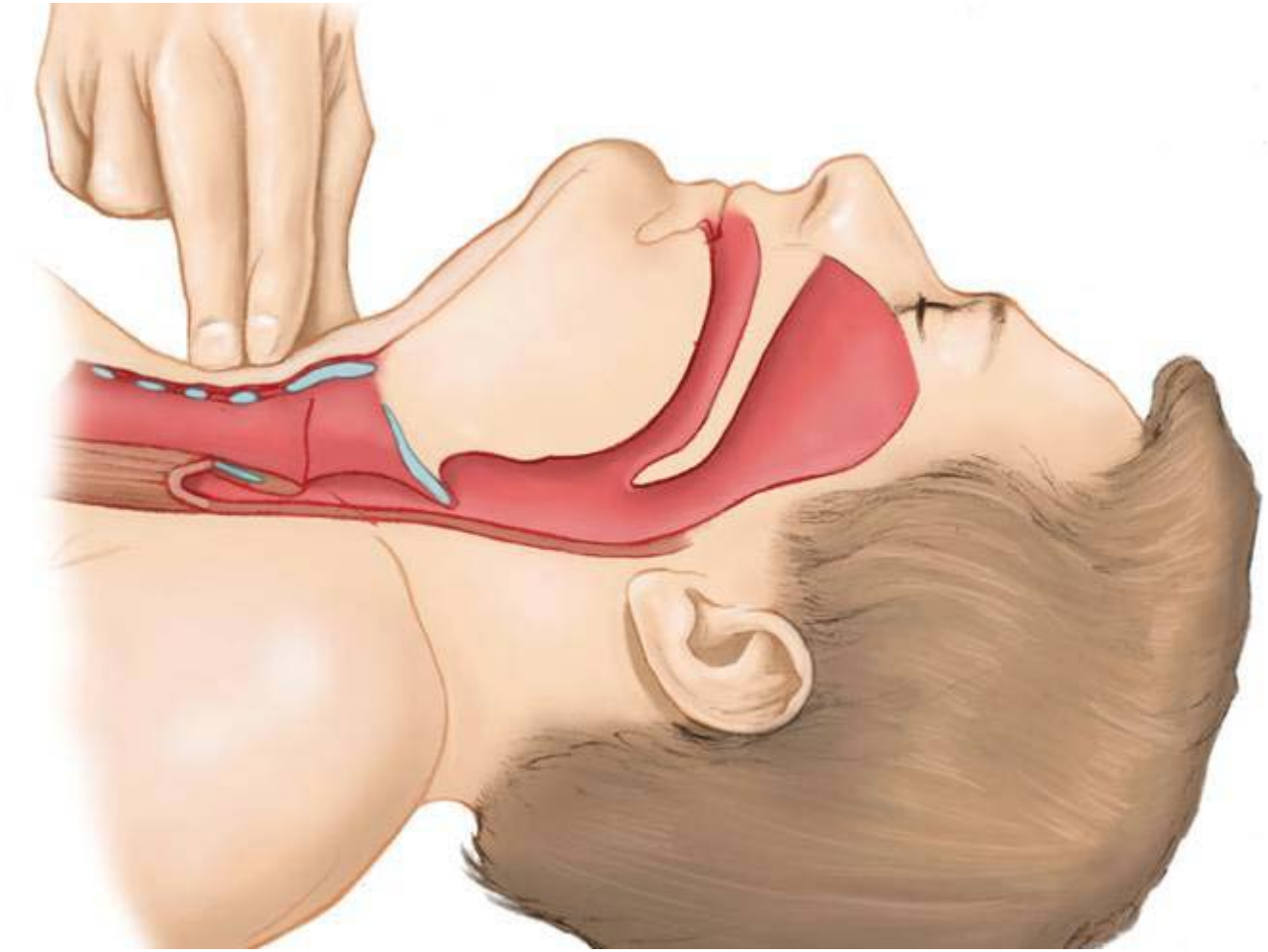
Sellick's maneuver (cricoid pressure)



Airway before applying Sellick's

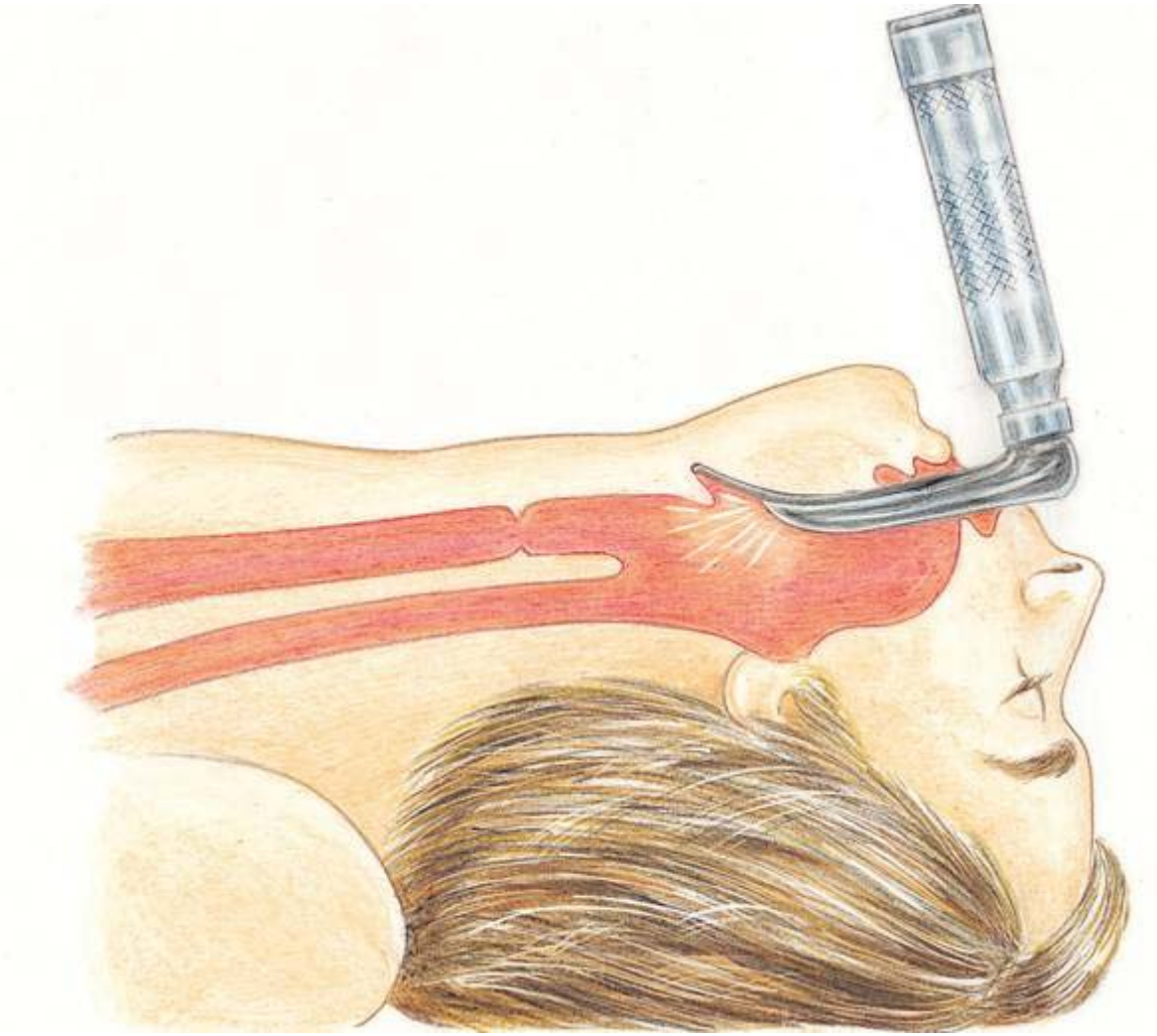


Airway with Sellick's applied (note compression on the esophagus).

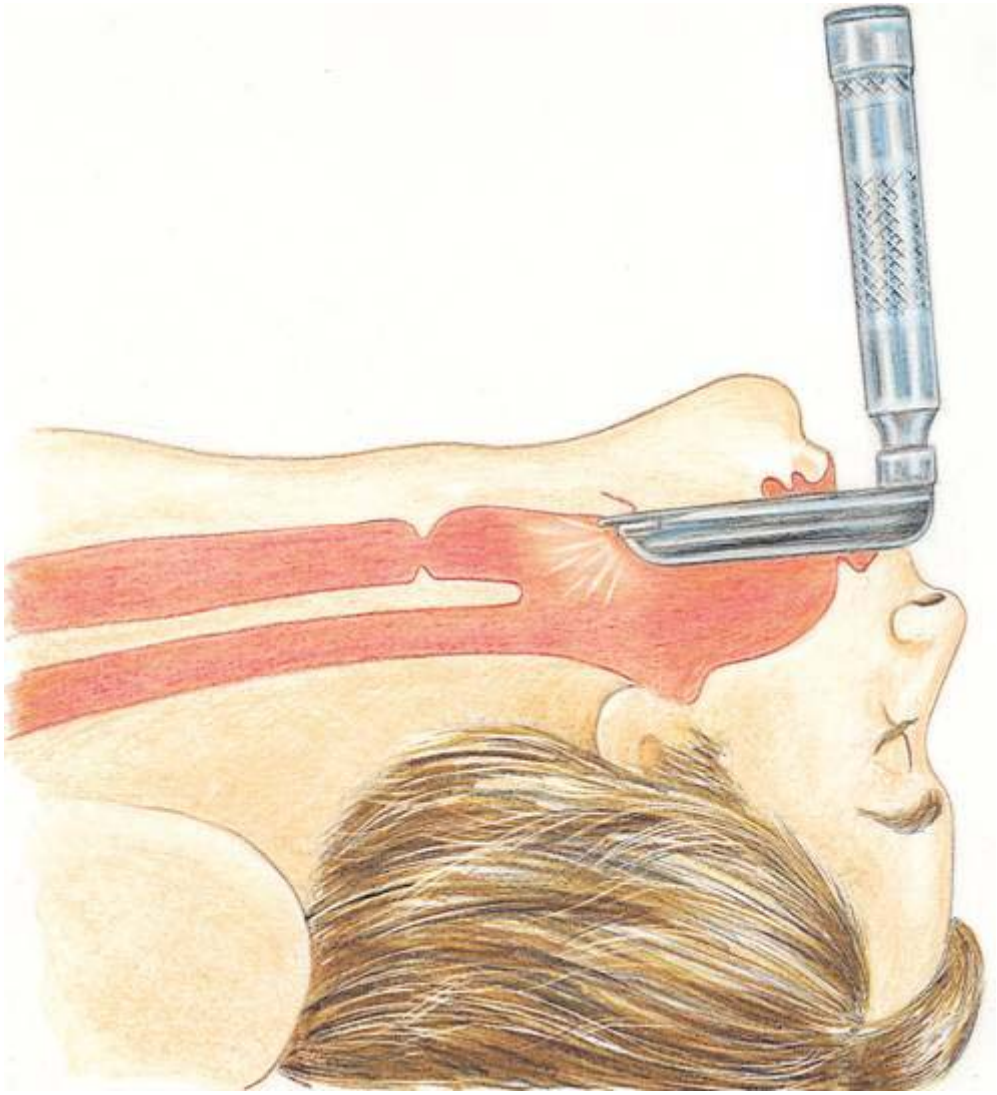


Endotracheal intubation is clearly the preferred method
of advanced airway management in prehospital emergency care.

Placement of Macintosh blade into vallecula



Placement of Miller blade under epiglottis



Endotracheal Intubation Indicators

- Respiratory or cardiac arrest.
- Unconsciousness.
- Risk of aspiration.
- Obstruction due to foreign bodies, trauma, burns, or anaphylaxis.
- Respiratory extremis due to disease.
- Pneumothorax, hemothorax, hemopneumothorax with respiratory difficulty.

Advantages of Endotracheal Intubation

- Isolates trachea and permits complete control of airway.
- Impedes gastric distention.
- Eliminates need to maintain a mask seal.
- Offers direct route for suctioning.
- Permits administration of some medications.

Disadvantages of Endotracheal Intubation

- Requires considerable training and experience.
- Requires specialized equipment.
- Requires direct visualization of vocal cords.
- Bypasses upper airway's functions of warning, filtering, and humidifying the inhaled air.

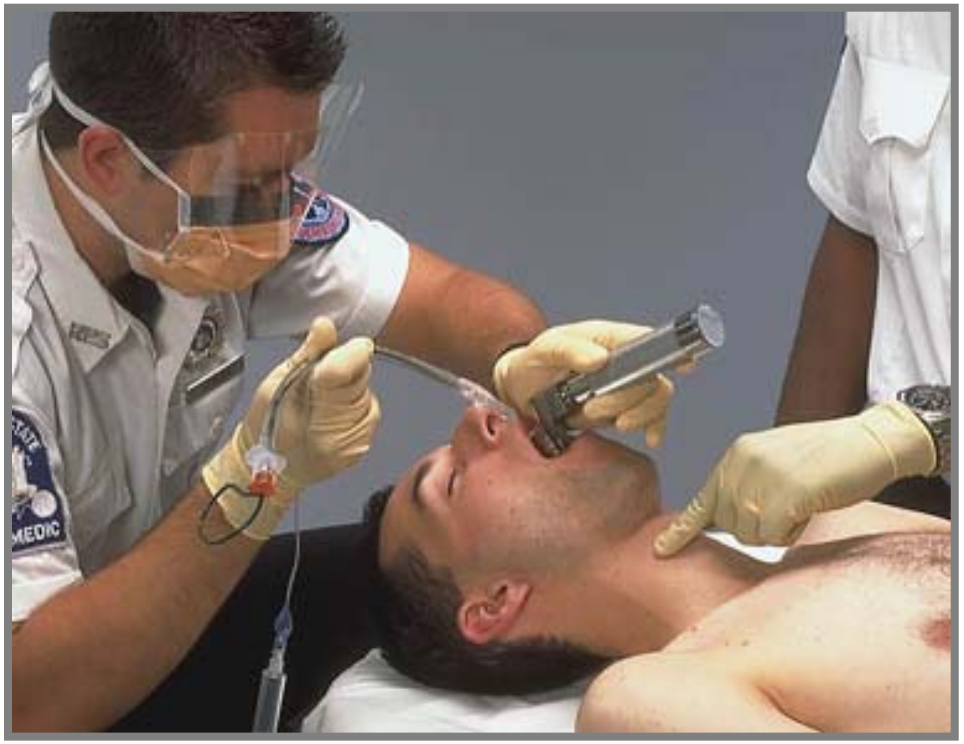
Complications of Endotracheal Intubation

- Equipment malfunction
- Teeth breakage and soft tissue lacerations
- Hypoxia
- Esophageal intubation
- Endobronchial intubation
- Tension pneumothorax

Hyperventilate patient.

Prepare equipment.

Visualize larynx and insert the ETT.

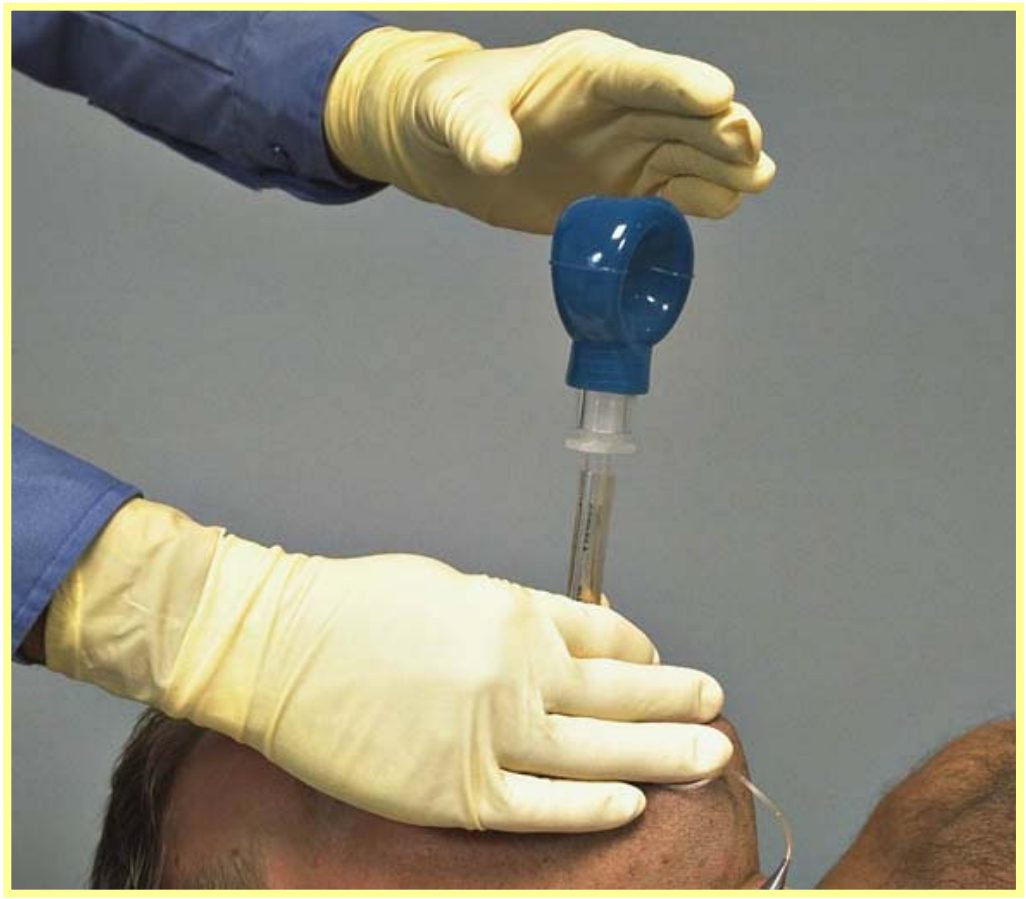


Inflate cuff, ventilate, and auscultate.

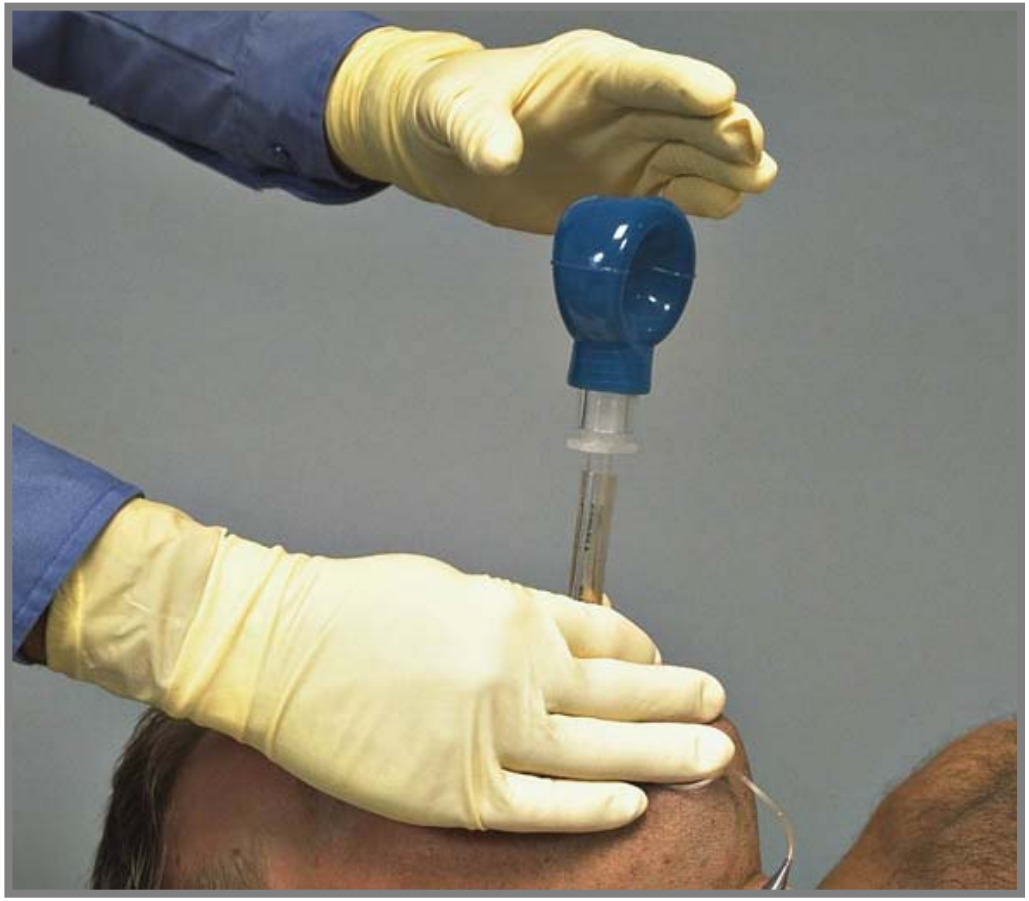
Esophageal detector device

An esophageal intubation detector-bulb style.

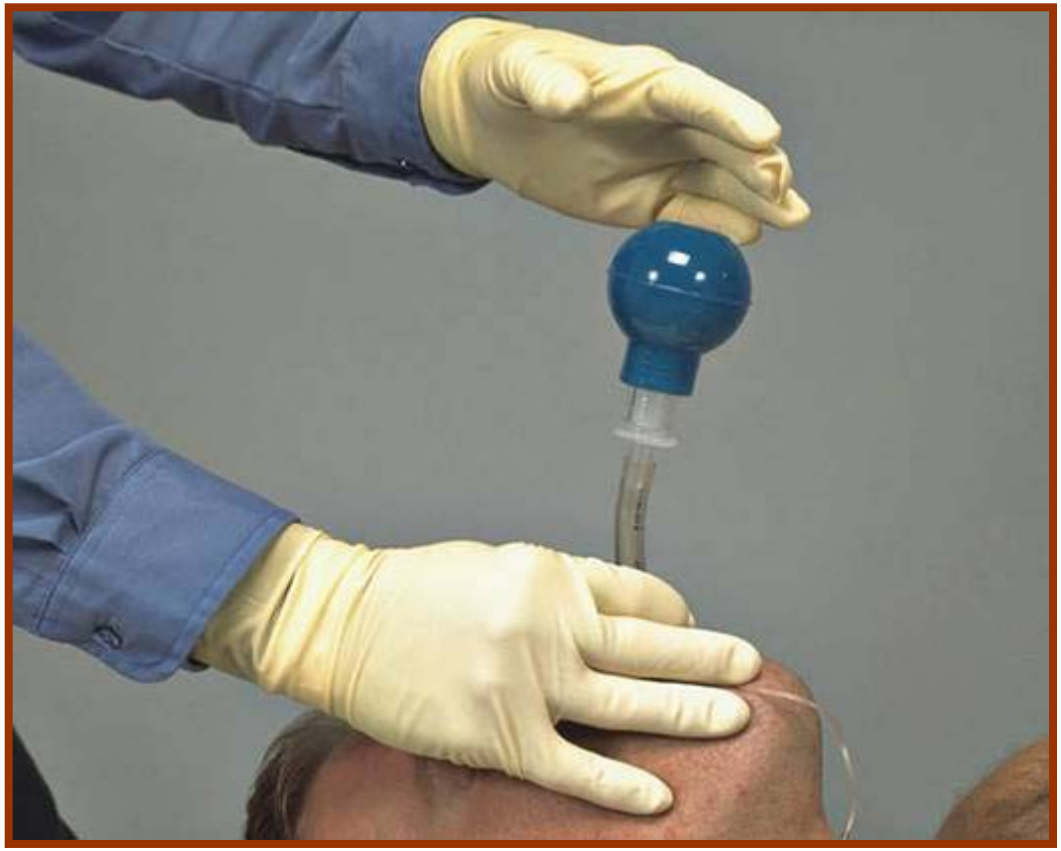
A. Attach device to endotracheal tube and squeeze the detector.



If the bulb does not refill, the tube is improperly placed.



If bulb refills easily upon release, it indicates correct placement.



Confirm placement with an ETCO2 detector.

Secure tube.

Continuously recheck and reconfirm the placement of the endotracheal tube.

The Pediatric Airway

- Smaller and more flexible than an adult.
- Tongue proportionately larger.
- Epiglottis floppy and round.
- Glottic opening higher and more anterior.
- Vocal cords slant upward, and are closer to the base of the tongue.
- Narrowest part is the cricoid cartilage.